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10/763,047	01/22/2004	David L. Hagen	P/3474-92	3778

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EXAMINER	
BOYER, RANDY	

ART UNIT	PAPER NUMBER
1797	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/763,047	HAGEN ET AL.	
	Examiner	Art Unit	
	RANDY BOYER	1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 April 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-84* is/are pending in the application.

4a) Of the above claim(s) *1-39,63-75,77 and 81-84* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *40-62,76 and 78-80* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Examiner acknowledges Applicant's response filed 9 April 2008 containing amendments to the claims and remarks.

2. Claims 1-84 are pending. Claims 1-39, 63-75, 77, and 81-84 have been withdrawn from consideration. Consequently, only claims 40-62, 76, and 78-80 are pending for examination.

3. Examiner acknowledges that Applicant's amendment to claims 43, 47, 48, and 55 are sufficient to overcome the previous objections.

4. The previous rejections of claims 40-62, 76, and 78-80 under 35 U.S.C. 103(a) are maintained. The rejections follow.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office Action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claims 40-42, 45, 46, 49-58, 61, 62, 76, and 78-80 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meenan (US 4,273,527) in view of Faulkner (US 4,483,137).

9. With respect to claims 40 and 76, Meenan discloses a method of reacting reactants, the method comprising: (a) configuring a reactor (10); the reactor (10) having a streamwise curvilinear fluid flow direction (see Meenan, Fig. 1) (showing a curved delivery path for delivery of reactants) and a first and a first and second transverse directions (see Meenan, Fig. 1) (e.g. the first direction being parallel to the central axis of the reactor (10) and the second direction being perpendicular to the central axis of the reactor (10)) mutually distinct from the streamwise flow direction, the first and second transverse directions defining a surface through a reactor (see Meenan, column

3, lines 17-21) (describing wherein the reactor (10) is mounted in a refractory lined housing) location transverse to the flow; (b) configuring a reactant delivery system (12) and delivering a reactant fluid (air) comprising reactant (air) to the reactor (10); (c) configuring a co-reactant delivery system (18) and delivering a co-reactant fluid (gas) comprising co-reactant (gas) to the reactor (10); (d) controlling the spatial delivery of the reactant fluid (air) comprising reactant (air) into the reactor (10) in at least one of the transverse directions (e.g. by use of an air compressor) (see Meenan, column 2, lines 27-29); (e) reacting reactant (air) with co-reactant (gas) to form a reaction product (combustion gas) (see Meenan, column 3, lines 26-40); delivering to an outlet of the reactor (10) a product fluid (combustion gas) comprising reaction product, and a residual component comprising at least one of reactant and co-reactant (see Meenan, column 3, lines 26-40); and wherein controlling the at least one spatial distribution of the reactant fluid (air) (e.g. by use of an air compressor) (see Meenan, column 2, lines 27-29) in at least one of the transverse directions controls the transverse distribution of at least one of the composition, temperature, pressure, and streamwise velocity of the product fluid, near the reactor in at least one of the transverse directions (see Meenan, entire disclosure).

Meenan does not disclose wherein the reaction occurs in the presence of a diluent; and wherein the method further includes (i) configuring a diluent delivery system and delivering the diluent fluid to the reactor; (ii) controlling a spatial delivery of the diluent fluid comprising a diluent into the reactor, the distribution being taken in at least one of the transverse directions; (iii) mixing diluent with at least one of reactant, co-

reactant, and reaction product; (iv) and delivering to an outlet of the reactor a product fluid comprising diluent; wherein controlling the spatial distribution of the diluent fluid in at least one of the transverse directions controls the transverse distribution of at least one of composition, temperature, pressure, and streamwise velocity of the product fluid.

However, Faulkner discloses a method/system for reacting air and fuel via combustion wherein the method includes the introduction of a liquid coolant (diluent) into the combustion chamber (see Faulkner, Abstract; column 1, lines 5-39; and column 2, lines 5-15). Faulker explains the benefit of adding diluent to the combustion chamber being the reduction of flame temperature and corresponding decrease in the amount of thermal NO_x (a known harmful pollutant) produced (see Faulkner, Abstract; column 1, lines 5-39; and column 2, lines 5-15).

Therefore, the person having ordinary skill in the art of methods for reacting gaseous reactants would have been motivated to modify the method/reactor of Meenan to incorporate the diluent addition system of Faulkner in order to lower the flame temperature and thereby limit the amount of NO_x produced in the reactor of Meenan.

Finally, the person having ordinary skill in the art of methods for reacting gaseous reactants would have had a reasonable expectation of success in incorporating the diluent delivery system of Faulkner in the method/reactor of Meenan because both Meenan and Faulker are directed to methods/systems for the combustion reaction of air and gas.

10. With respect to claims 41 and 42, Faulkner discloses wherein the diluent fluid comprises water (see Faulkner, column 2, lines 5-9) and wherein the diluent is added to control the reaction temperature (see Faulkner, column 2, lines 5-15).

11. With respect to claim 45, Meenan discloses wherein the spatial delivery of the reactant fluid (air) into the reactor may be modulate (e.g. by use of an air compressor) (see Meenan, column 2, lines 21-29).

12. With respect to claim 46 and 78, Faulker discloses wherein the amount of diluent delivered to the reactor may be varied and wherein pressure oscillations within the reactor are minimized (see Faulkner, entire disclosure; and especially columns 2-3). Moreover, Faulkner discloses controlling reaction temperature by addition of a diluent (water) (see Faulkner, entire disclosure). Thus, the person having ordinary skill in the art would recognize that controlling reaction temperatures would have a corresponding change on reaction pressures.

13. With respect to claims 49-52, Meenan discloses wherein the co-reactant (gas) is diffused in the reactor (i.e. via jet openings of the tubular conduits (18)). In addition, Faulkner discloses (1) wherein the diluent is delivered concurrently with the fuel (see Faulkner, column 2, lines 5-9); (2) wherein the diluent is evaporated (see Faulkner, column 1, lines 40-46); and wherein the diluent is delivered as liquid water (see Faulkner, column 2, lines 5-9; column 9, lines 42-60; and entire disclosure).

14. With respect to claim 53, Meenan discloses wherein the reactant delivery system is configured to form staged reactable and non-reactable regions (see Meenan, Fig. 1 (e.g. the non-reactable regions being the separations between adjacent air (12) and gas

(18) conduits)) and wherein a reactable fluid (e.g. pulverized fuel) may traverse the reactable regions (after injection via opening (47)) (see Meenan, Fig. 1 and entire disclosure).

15. With respect to claim 54, Meenan discloses wherein the reactant (or co-reactant) comprises air, and the co-reactant (or reactant) comprises a combustible fuel (gas) (see Meenan, entire disclosure). In addition, Faulkner discloses wherein the diluent is liquid water (see Faulkner, column 2, lines 5-15).

16. With respect to claim 55, Meenan discloses combusting the fuel with oxidant in the reactor (see Meenan, entire disclosure).

17. With respect to claims 56-58, Faulkner is not particularly limited with respect to the exact location within the reactor / combustion chamber the diluent is to be delivered. Moreover, the person having ordinary skill would recognize from a complete reading of Faulkner that the amount of diluent to be delivered could be changed based on the desired operating temperature and/or NO_x emission levels (see Faulkner, entire disclosure).

18. With respect to claim 61, Meenan discloses wherein water is used to cool a portion of the reactor (see Meenan, Fig. 2 and accompanying text), while Faulkner discloses the use of water as a diluent (see Faulkner, column 2, lines 5-15).

19. With respect to claims 62, 79, and 80, Faulkner discloses the addition of diluent to control the reaction temperature (see Faulkner, entire disclosure).

20. Claims 43, 44, 46, and 78 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meenan (US 4,273,527) in view of Faulker (US 4,483,137) and Stickler (US 5,349,811).

21. With respect to claims 43 and 44, see discussion *supra* at paragraph 9.

Neither Meenan nor Faulkner discloses acoustically modulating the delivery of at least one of the delivered fluids to at least 10 Hz.

However, Stickler discloses a pulsed fuel injection systems usable for injecting reactant fluids into a reaction chamber whereby the delivery of reactant fluid is acoustically modulated to at least 10 Hz (see Stickler, Abstract; and column 4, lines 24-31). Stickler explains that by delivering the reactant fluid to the combustion chamber in such a manner, the resulting formation of NO_x pollutants in the combustion gas is greatly reduced (see Stickler, Abstract).

Therefore, the person having ordinary skill in the art of methods for reacting gaseous reactants would have been motivated to modify the method/reactor of Meenan to (1) incorporate the diluent addition system of Faulkner in order to lower the flame temperature and thereby limit the amount of NO_x produced in the reactor of Meenan; and (2) acoustically modulate the delivery of at least one of the delivered fluids to at least 10 Hz (as taught by Stickler) in order to further reduce the production of NO_x in the combustion gas.

Finally, the person having ordinary skill in the art of methods for reacting gaseous reactants would have had a reasonable expectation of success in incorporating the diluent delivery system of Faulkner in the method/reactor of Meenan and acoustically

modulating the delivery of reactant fluid (as taught by Stickler) because (1) Meenan, Faulker, and Stickler are all directed to methods/systems for the combustion reaction of air and gas; and (2) both Meenan and Stickler are concerned with means by which to reduce the formation of NO_x pollutants in combustion gas.

22. With respect to claims 46 and 78, Stickler discloses wherein the reactor pressure can be controlled by adjusting the delivery of reactant fluid to the reactor (see Stickler, Abstract; and columns 8-9).

23. Claims 47, 48, 59, and 60 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meenan (US 4,273,527) in view of Faulkner (US 4,483,137) and Cole (US 4,176,637).

24. With respect to claims 47, 48, 59, and 60, see discussion *supra* at paragraph 9.

Neither Meenan nor Faulkner discloses electrically exciting a portion of the hot fluid in the reactor to at least 2 kHz.

However, Cole discloses a method/apparatus usable in the reacting of air and fuel in combustion chambers whereby an electric charge is supplied to the gaseous reaction mixture so as to effect a better mixing of the gaseous reactants and a more complete combustion reaction (see Cole, Abstract; and column 2, lines 39-57).

Therefore, the person having ordinary skill in the art of methods for reacting gaseous reactants would have been motivated to modify the method/reactor of Meenan to (1) incorporate the diluent addition system of Faulkner in order to lower the flame temperature and thereby limit the amount of NO_x produced in the reactor of Meenan, and (2) supply an electric charge to the reaction chamber (as taught by Cole) in order to

promote a better mixing of the gaseous reactants and a more complete combustion reaction.

Finally, the person having ordinary skill in the art of methods for reacting gaseous reactants would have had a reasonable expectation of success in incorporating the diluent delivery system of Faulkner in the method/reactor of Meenan, and providing an electric charge to the reaction chamber (as taught by Cole) because Meenan, Faulker, and Cole are all directed to methods/systems for the combustion reaction of air and gas.

Response to Arguments

25. Applicant's arguments filed 9 April 2008 have been fully considered but they are not persuasive.

26. Examiner understands Applicant's principal arguments to be:

I. Meenan makes no reference to "control," "uniform," "nonuniform," "homogeneous," "inhomogeneous," "distribution," "transverse," "ratio," "stoichiometric," or "composition."

II. Meenan makes no mention of "modulating," "varying," "controlling," "dynamically," "oscillations."

III. Faulkner does not mention "modulating," "dynamically," "oscillation," "noise," "acoustic," "rumble," "growl," "hum," "whistle," or "vibration."

IV. Stickler makes no mention of "transverse" or "spatial."

V. Neither Stickler nor Faulker makes mention of "choke" or "surge."

VI. Cole does not refer to "distribution," "transverse," "spatial," "homogeneous," "inhomogeneous," "uniformity," "pressure," or "composition."

VII. Neither Cole nor Faulker makes mention of "modulate," "oscillate," "vary," "dynamic," "frequency," "Hz," "pulsate," "fluctuate," "acoustic," "noise," or "pressure."

VIII. Meenan does not disclose "a curved delivery path for delivery of reactants" that results in "the first direction being parallel to the central axis of the reactor." Neither the "first direction" nor the "second direction" of Meenan can be "parallel to the central axis of the reactor."

IX. Meenan makes no mention of controlling or varying that pressure.

X. Meenan does not teach "controlling the spatial delivery of the reactant fluid . . . in at least one of the transverse directions" by configuring the orifices or by varying fluid flow, to affect spatial delivery in "at least one of the transverse directions" distinct from the reactor streamwise flow.

XI. Meenan does not teach "modulating the spatial delivery of the reactant fluid into the reactor to reduce fluid pressure oscillation within the reactor."

XII. Meenan does not teach delivering diluent (e.g., water, steam, or CO_2) into the combustor.

XIII. Meenan does not form "non-reactable regions" by the relative delivery of fuel and diulent.

XIV. Meenan provides neither a diluent delivery system nor a high voltage power supply for the diluent delivery system.

27. With respect to Applicant's first through seventh arguments, Examiner views such arguments as irrelevant. There is no requirement that the prior art references applied in an obviousness rejection use the identical or exact language as Applicant's claims in order to be available for use to show anticipation or obviousness of Applicant's

claimed subject matter. Rather, the only requirement that the references teach *or suggest* all the claim limitations. See MPEP § 2143. Furthermore, in considering the disclosure of a prior art reference, it is proper to take into account not only specific teachings of the reference but also the inferences which one skilled in the art would reasonably be expected to draw therefrom. See MPEP § 2144.01 (citing *In re Preda*, 401 F.2d 825 (CCPA 1968)). Finally, Examiner notes that ordinary and simple English words (e.g., "transverse," "spatial delivery," "spatial distribution delivery," "spatial distribution," "transverse distribution," etc.) whose meaning appears clear and unquestionable, absent any clear indication that their use in a particular context changes their meaning, are construed to mean exactly what they say. See MPEP § 2111.01 (citing *Chef America, Inc. v. Lamb-Weston, Inc.*, 358 F.3d 1371 (Fed. Cir. 2004)). Additionally, it should be noted that the words in a claim are generally *not* limited in their meaning by what is shown or disclosed in the specification. See MPEP § 2111.01 (citing *Liebel-Flarsheim Co. v. Medrad Inc.*, 358 F.3d 898 (Fed. Cir. 2004)).

28. With respect to Applicant's eighth argument, Applicant's claim specifically requires ". . . the reactor having a streamwise curvilinear fluid flow direction and a first and second transverse directions mutually distinct from the streamwise flow direction, . . ." (see Applicant's claim 40). In this regard, Meenan very clearly discloses a reactor (10) having annular conduits (12) for the delivery of air (a reactant). Given this design, the air flowing through the annular conduit (12) of Meenan's reactor (10) will undoubtedly have a "streamwise curvilinear fluid flow," the air flow conforming to the shape of the annular conduit (12) through which it is flowing. In addition, Meenan very

clearly shows fuel inlet nozzles (42, 44) for injection of fuel. It is noted that the injection of fuel through nozzles (42, 44) is in a direction that is clearly "transverse" in direction vis-à-vis the air flowing in conduits (12) (see Meenan, Figs. 1 and 2) and furthermore parallel to the central axis of the reactor (10). In addition, Meenan provides for the injection of pressurized gas from a premix burner through the jet openings of conduit (18), thereby providing for the radial injection of the gas into the reactor (10) and in a direction that is clearly "transverse" in direction vis-à-vis the air flowing in conduits (12) (see Meenan, Figs. 1 and 2).

29. With respect to Applicant's ninth through eleventh arguments, Examiner notes that Meenan very clearly discloses wherein air is supplied in pressurized form by means of, for example, an air compressor (see Meenan, column 2, lines 27-29). Likewise, pressurized gas is delivered to the reactor of Meenan by means of a premix burner (see Meenan, column 2, lines 29-33). Examiner notes that at the very least, the air compressor and gas premix burner would be expected to each have at least two modes of operation (i.e. either "on" or "off"). Thus, whether controlled automatically or by means of manual operation, the cycling of the air compressor and/or gas premix burner from "off" to "on" (or vice versa) in at least the start-up or shut-down phases of Meenan's reactor would necessarily result in a variation of pressure and fluid flow inside the reactor thereby modulating a spatial delivery of reactant fluid into the reactor.

30. With respect to Applicant's twelfth argument, Examiner notes that Faulker (not Meenan) very clearly discloses the use of water (diluent) into the combustor (see discussion *supra* at paragraph 9). In such case, Applicant's argument is not persuasive

because one cannot show nonobviousness by attacking references *individually* where the rejections are based on *combinations* of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

31. With respect to Applicant's thirteenth argument, see discussion *supra* at paragraph 14.

32. With respect to Applicant's fourteenth argument, Faulker (not Meenan) very clearly discloses a diluent delivery system (see discussion *supra* at paragraph 9) and Cole (not Meenan) very clearly discloses use of a high voltage power supply (see discussion *supra* at paragraph 24). In such case, Applicant's argument is not persuasive because one cannot show nonobviousness by attacking references *individually* where the rejections are based on *combinations* of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

33. With respect to the remainder of Applicant's arguments regarding the disclosure of Faulkner, Stickler, and/or Cole in combination with Meenan, see discussion *supra* at paragraphs 9-24.

Conclusion

34. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

35. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Randy Boyer whose telephone number is (571) 272-7113. The examiner can normally be reached Monday through Friday from 8:00 A.M. to 5:00 P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola, can be reached at (571) 272-1444. The fax number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

RPB

/Glenn A Caldarola/

Acting SPE of Art Unit 1797